

## “ZNR” Transient/Surge Absorbers, Type E

## “ZNR” Transient/Surge Absorbers, Type CK, SC

### Precautions for Handling

#### 1. ⚠Precautions for Safety

The “ZNR” Transient/Surge Absorbers (hereafter referred to as “The ZNR Varistors”) may fail in a short-circuit mode or in an open-circuit mode, when subjected to severe conditions of electrical, environmental and/or mechanical stresses beyond their specified “Ratings” and specified “Conditions”, resulting in burnout, flaming or glowing in the worst case.

Following “⚠Precautions for Safety” and “Application Notes” shall be taken in your major consideration. If you have a question about the “Precautions for Handling”, please contact our engineering section or factory.

#### 1.1 ⚠Operating Conditions

1.1.1 The ZNR Varistors shall not be operated beyond the specified “Ratings” and “Environmental Conditions” in the Catalog or the Specifications to prevent them from deterioration, breakdown, flaming or glowing.

- The ZNR Varistors shall not be operated exceeding the specified “Maximum Allowable Voltage” in the Catalog or the Specification.
- The ZNR Varistors shall not be subjected to energy levels above their specified “Maximum Energy Ratings” in the Catalog or the Specifications.
- In case of application to repeated surge/overvoltages, the ZNR Varistors shall not be subjected to surge currents and energy levels above the specified maximum ratings in “Impulse Life Rating” in the Catalog or the Specifications.
- When surge/overvoltages are intermittently applied to the ZNR Varistors with short durations, the devices shall not be operated beyond the specified “Rated Power” in the Catalog or the Specifications.
- The ZNR Varistors shall not be operated beyond the specified “Operating Temperature Range” in the Catalog or the Specifications.
- It is recommended that the ZNR Varistors, if not fused, shall be located away from other combustible components.

1.1.2 The ZNR Varistor shall be operated correctly under following conditions to prevent Varistors from causing mechanical damages and ruptures and to protect human from serious injuries;

- The ZNR Varistors shall not be operated exceeding the specified “Maximum Allowable Voltage Ratings” in the Catalog.
- The ZNR Varistors shall not be operated beyond the “Maximum Peak Current Ratings” in the Catalog.
- Some safety countermeasure such as a protective case covering the Varistor is recommended, if necessary.

1.1.3 When the ZNR Varistors are applied to between a live part and a metallic chassis of equipment, following safety countermeasures shall be taken to protect human from electric shock.

- A) The metallic chassis shall be earthed to the ground.
- B) The live part shall be equipped with a protective cover for preventing electric shock.

#### ● Recommendation fuse

Series	ERZC20EK□□□□	ERZC32□K□□□□	ERZVS34C□□□□ ERZC40CK□□□□
Current Fuse (Line - Line)	10 A max.	20 A max.	20 A max.
Thermal. Fuse (Line - Ground)	100 to 120 °C 5 A	100 to 120 °C 10 A	100 to 120 °C 10 A

- \* Fuses shall use rated voltages appropriate for circuits.
- \* Finally, confirm that the secondary disaster does not occur even if the ZNR mounted on equipment breaks.
- \* Set a thermal fuse to get high thermal conductivity with ZNR.

## 2. Application Notes

### 2.1 Protective Devices for Varistors

2.1.1 The ZNR Varistors shall be protected from serious accidents due to unexpected physical phenomenon by following safety countermeasures.

- In case of “Across-the Line Use”, the ZNR Varistors shall be protected by connecting a ground fault circuit interrupter or fusing in series to the devices. (See Table 1)
- In case of “Line to Ground Use”, the short-circuit of the Varistor may not blow the current type fuse due to the grounding resistance (between Line and Ground), which may cause flaming or burnout of the devices in the worst case.

Following safety countermeasures (A or B) are recommended;

- A) Connecting a “leakage current circuit breaker” in series to the Varistor to be protected. (See Table 1)
- B) Use current type fuses and a thermal type fuse which are thermally coupled each others. (See Table 1)

## 2.2 Circuit Design 1

### (Selection of Varistor Voltage Rating)

#### 2.2.1 General Precautions

In selection of Varistor Voltage Ratings for line protection, following general precautions shall be taken in your consideration;

- (1) Maximum operating voltage shall be lower than the specified “Maximum Allowable Voltage” of the Varistor applied.
- (2) Some reasonable margin is required against fluctuation of the primary AC line Voltage where the Varistor is applied for preventing mechanical and/or electrical failures of the device.

#### 2.2.2 Across-the-Line Use

(Line to Line surge protection)

- Select the ZNR Varistors recommended in Table 1.

**Notes:** Because the primary line voltage temporarily rises due to load unbalance of separately wired loads, short circuit between the live line and the neutral line or LC resonance at switching for a capacitive load, ZNR Varistors with \* are recommended for AC120 V or 240 V applications. (See Table 1)

#### 2.2.3 Line to Ground Use

(Line to Ground Surge protection)

- Select the ZNR Varistors recommended in Table 1.

**Notes:** When 500 V insulation resistance test of the circuits employing ZNR Varistor is conducted, the ZNR Varistor shall be removed after getting approval from the customer, or the ZNR Varistor \* \* with the Maximum Allowable Voltage exceeding to the test voltage shall be applied. (See Table 1)

When AC1000 V or 1200 V dielectric with standing test is conducted, ZNR Varistors shall be removed after getting approval from the customer according to the relevant regulations, or ZNR Varistor \* \* \* with the Maximum Allowable Voltage exceeding to the test voltage shall be applied. (See Table 1)

## 2.3 Circuit Design 2 (Fusing Varistors)

2.3.1 When a line current rating is higher than the recommended current rating of the fuse in Table 2, the location of the fuse shall be arranged according to Fig 2.

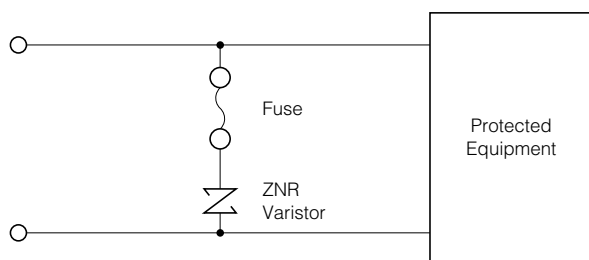


Fig. 2 Alternative Fuse Location/placement for Varistor Protection

## 2.4 Environmental Conditions

- (1) The ZNR Varistors shall not be exposed outdoors, because of being designed for indoors use.
- (2) The ZNR Varistors shall not be operated beyond the Specified Operating Temperature Range and shall not be exposed to direct sunlight and heating part of equipment.
- (3) The ZNR Varistors shall not be operated under severe conditions of high temperatures and high humidities such as places exposed to rain, wind and vapor.
- (4) The ZNR Varistors shall be free from dust, salty wind and atmospheres polluted by corrosive gas.

## 2.5 Precautions for Assemblies and Handlings

### 2.5.1 Solvent Cleaning

Organic solvents such as thinner and acetone etc. shall not be applied to the ZNR Varistors for preventing deterioration of the external coating or molding resin.

### 2.5.2 Abnormal Mechanical Stresses

Abnormal mechanical stresses beyond the specified values such as strong falling shocks, vibrations and bending/pulling forces, shall be kept minimum to prevent mechanical/electrical failures of the devices.

### 2.5.3 Plastic Molding

If another plastic molding is applied to the ZNR Varistors on your option, the influences on reliability of the ZNR Varistors shall be carefully investigated in your equipment.

## 2.6 Long Term Storage

- (1) The ZNR Varistors shall not be stored under severe conditions of high temperatures and high humidities. Store them indoors under 40 °C max. and 75 %RH max. Use them within one year, if stored beyond the limit, check the solderability before use.
- (2) The ZNR Varistors shall not be stored under corrosive atmospheres such as hydrogen sulfide, sulfurous acid, chlorine and ammonia.
- (3) The ZNR Varistors shall not be exposed to direct sunlight and shall not be stored under dew formation.

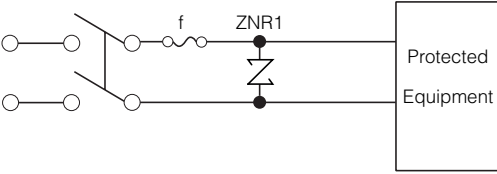
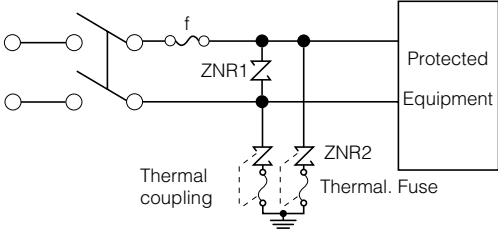
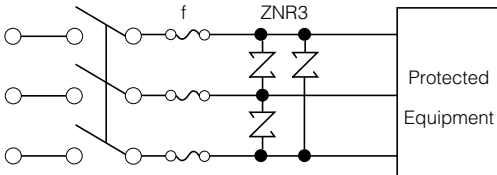
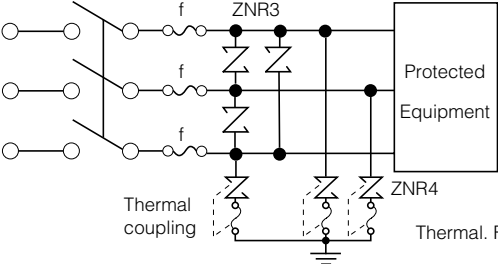
## 2.7 Regarding to “Safety Regulations of the Varistors”

In case of applications to UL and CSA standards, refer to “Application Notes for UL and CSA Recognized” ZNR “Varistors”

## 2.8 Parallel Capacitances of the ZNR Varistors

The ZNR Varistors have relatively high capacitances specified in the individual specifications, special consideration shall be taken into account in applications to high frequency transmission lines or circuits.

Table 1. Application Examples

	Across-the-Line/Line to Line Protection			Line to Line and Line to Ground Protection		
	D.C. A.C. Single phase			D.C. A.C. Single phase		
Connections						
	f : fuse			f : fuse		
Connections	A.C. 3 phase			A.C. 3 phase		
						
	f : fuse			f : fuse		
Selection Examples	Across the Line Use/Line to Line			Line to Ground Use		
	ZNR	Nominal Line Voltage	Part Number of ZNR Type E, CK, SC	ZNR	Nominal Line Voltage	Part Number of ZNR Type E, CK, SC
	ZNR1 ZNR3	AC 100 V	ERZC□□EK ERZC□□CK ERZVS34C	ZNR2 ZNR4	AC 100 V to AC 220 V	471 511 821 **
		AC 120 V	241 271 *			
		AC 200 V to AC 220 V	471		AC 240 V	511 821 **
		AC 240 V	511			